

Green FDI Beyond Renewables:

Mapping the Geography of Transition-Relevant Investment in Europe

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Motivation

Foreign direct investment (FDI) is a critical vehicle for financing the green transition, mobilising the capital, skills and know-how needed for industrial decarbonisation and technological transformation. Yet “green FDI” remains systematically under-measured. Existing approaches rely predominantly on sector proxies (classifying entire industries such as renewable energy and waste as “green”) while remaining blind to green activities embedded within manufacturing and services. This produces a partial and geographically skewed picture of transition-relevant investment, one that over-represents regions endowed with solar and wind resources and under-represents those where green transformation occurs through industrial capabilities and innovation ecosystems.

This paper addresses this measurement gap by introducing a taxonomy-guided, project-level classification framework. We combine large language models (LLMs) with the EU Taxonomy for Sustainable Activities (EUTSA) to evaluate whether individual FDI projects are consistent with sector-specific green activities and technical screening criteria. Applying this approach to 109,084 inward greenfield FDI projects into the EU27+UK over 2013–2024, we uncover a substantially broader and more geographically diverse landscape of green investment than sector-based metrics reveal. For regional scientists, this matters: the geography of the green transition is not determined solely by natural endowments, but by industrial capabilities, innovation ecosystems, and investment promotion strategies. These are precisely the kinds of place-based factors that regional policy can shape.

Methodology

Project-level FDI data come from Orbis-Crossborder (Bureau van Dijk/Moody’s Analytics), which provides textual descriptions of individual greenfield investments, essential for activity-level classification. The EUTSA defines qualifying green activities across 60 of the 87 NACE 2-digit codes in our sample, covering activities that contribute to one of six environmental objectives (including climate change mitigation, circular economy transition, and pollution prevention), accompanied by detailed technical screening criteria.

For projects in Renewable Energy & Waste (REW) sectors, green classification follows directly from the sector label. For all other projects, we prompt GPT-4 with each project description alongside the relevant EUTSA sector text. Projects are processed in two stages: first against broader activity descriptions, then (for those initially identified as green) against the full technical

screening criteria, reducing false positives and aligning classification with the EUTSA’s compliance requirements. The pipeline achieves an F1 score of 0.84 against blinded human coding (rising to 0.93 when evaluators review model reasoning), and exhibits high reproducibility across alternative prompts, temperature settings, and model providers. We also implement a more lenient “upper bound” classification to bound our estimates. Full replication materials are publicly available.¹

Key Findings

A larger and growing green FDI landscape. Nearly one in six dollars (15.7%) of inward FDI into the EU27+UK over 2013–2024 qualifies as green under our framework, roughly twice the share captured by focusing on renewable energy and waste alone. Approximately half of this green FDI lies *beyond* REW sectors (7.4% of total FDI value). The temporal trajectory is striking: REW green FDI has stagnated at around 8–10% since 2013, while beyond-energy green FDI has grown steadily from near zero, accounting for the majority of green FDI by 2022–2024.

Green FDI is concentrated in knowledge-intensive manufacturing. Beyond-energy green FDI is heavily concentrated in manufacturing, where 37% of all inward FDI qualifies as green. Knowledge-intensive sectors stand out: over one third of inward FDI in computers, electronics, and automobiles is classified as green. Across manufacturing sectors, there is a strong positive correlation between the share of innovative firms in a sector and the share of green FDI it attracts, consistent with the view that greening beyond renewables is fundamentally tied to technological capability and innovation capacity (UNCTAD, 2023).

Distinct geographies of investor origin. The provenance of green FDI differs sharply by type. REW green FDI is predominantly intra-European, led by Germany, France, Spain and Norway. Beyond-energy green FDI draws more heavily on extra-European sources: China, South Korea, the United States and India rank among the top five origin countries. Europe’s broader industrial greening is therefore critically dependent on technology transfer and manufacturing know-how from global leaders in electric vehicles, batteries and advanced materials, raising questions of strategic dependency and technological sovereignty (Pavlínek, 2023).

A more diverse regional geography of green investment. Sub-national patterns reveal stark heterogeneity masked by country-level aggregates. REW investments cluster predictably in resource-endowed regions: sun-rich areas of Spain, Portugal, southern France, Greece and Italy; offshore wind zones around the UK, Ireland and the Baltic Sea. Beyond-energy green FDI follows a fundamentally different logic. Eastern Europe’s industrial regions (notably in Hungary, Slovakia and Poland) have attracted large inflows into EV and battery manufacturing. Advanced metropolitan regions in Catalonia, Flanders, North-West England and North Rhine-Westphalia attract a broader mix of green manufacturing, R&D and services.

A typology of regional green FDI pathways. Plotting REW versus beyond-energy green FDI shares across European regions reveals four distinct profiles. *Green Leaders* attract high shares of both types, potentially leveraging renewable energy to catalyse broader green activities. *Energy-First* regions are strong in REW but have yet to translate this into wider industrial greening. *Green Without Sunshine* regions attract substantial beyond-energy green FDI despite

¹github.com/juanavilanova/green-fdi-taxonomy-llm

limited renewable endowments, representing nearly 29% of the EU27+UK population and 125 million citizens previously invisible in green investment statistics. *Emerging Frontiers* show low levels of both, but represent potential targets for strategic investment promotion.

Policy Implications

These findings carry direct implications for regional green industrial policy. First, focusing investment promotion on renewable energy misses a large and growing share of transition-relevant FDI, particularly in manufacturing sectors central to decarbonisation. Second, the association between innovation capacity and green FDI underscores the importance of building and signalling regional technological capabilities as a basis for attracting beyond-energy green investment. Third, the reliance on extra-European sources for industrial green FDI highlights strategic dependencies that investment promotion and trade policy may need to address. Finally, the “Green Without Sunshine” typology demonstrates that capability-based pathways to green transition through FDI are available to regions lacking natural renewable energy advantages, a finding with direct relevance for place-based cohesion policy design (Rodríguez-Pose and Bartalucci, 2024; Crescenzi and Harman, 2023).

References

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